

## Pentatomomorpha (Hemiptera: Heteroptera) Fauna of Herbaceous Plants in the Karacadağ Region of Diyarbakır and Şanlıurfa, Türkiye

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**ABSTRACT:** The present study was conducted to determine the Pentatomomorpha (Heteroptera) species associated with naturally growing herbaceous plants in the Karacadağ area located within Diyarbakır and Şanlıurfa provinces. Field surveys were carried out during 2021 using visual inspection and sweep net sampling methods in different localities situated on the slopes of Karacadağ. As a result of the study, 23 species belonging to the families Coreidae, Rhopalidae, Heterogastridae, Lygaeidae, Oxycarenidae, Rhyparochromidae, Pentatomidae, and Scutelleridae were identified. Among the recorded species, *Dolycoris baccarum*, *Aelia acuminata*, and *Eurygaster integriceps* were found to be widespread and abundant in the study area. In addition, *Heterogaster urticae* was recorded for the first time from Şanlıurfa Province, whereas *Eurygaster testudinaria* and *Odontotarsus purpureolineatus* were determined as first records for both Diyarbakır and Şanlıurfa provinces.

**KEYWORDS:** Pentatomomorpha, Heteroptera, Karacadağ, herbaceous plants, fauna, biodiversity, Diyarbakır, Şanlıurfa, Türkiye, Hemiptera.

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## INTRODUCTION

Karacadağ is an important natural area located between the provinces of Diyarbakır and Şanlıurfa in the Southeastern Anatolia Region of Türkiye and is notable for its volcanic basaltic structure. A large part of the region consists of lithosolic soils developed on basaltic parent material. In addition, brown forest soils, colluvial areas, rocky lands, and stony habitats constitute important components of the Karacadağ ecosystem. Although soil depth is limited in many parts of the region, Karacadağ possesses a remarkably rich herbaceous flora. This rich vegetation provides suitable feeding, sheltering, and breeding habitats for different insect groups. Species belonging to the order Heteroptera, in particular, constitute an important faunal group in both natural and agricultural ecosystems.

The Pentatomomorpha group within Heteroptera includes economically and ecologically important families such as Pentatomidae, Coreidae, Lygaeidae, Rhopalidae, and Scutelleridae. Some species within this group cause economic losses as agricultural pests on cultivated plants, whereas others play important roles in maintaining natural ecological balance. Species feeding on cereals, legumes, cotton, and various weeds are especially significant in agricultural production. In addition, some Pentatomomorpha species are considered important indicator organisms for determining biodiversity in natural habitats.

Studies on the Heteroptera fauna of Türkiye have been conducted for many years. Önder et al. (2006) presented a comprehensive catalogue of the Turkish Heteroptera fauna and reported numerous species records. In subsequent years, faunistic studies carried out in different regions provided more detailed information on species diversity in Türkiye. Dursun (2009) investigated Alydidae, Rhopalidae, and Stenoccephalidae species in the Kelkit Valley, while Dursun & Kartal (2008a, 2008b) reported important records of Pentatomidae species from the Middle Black Sea Region. Fent & Japoshvili (2012) studied the Heteroptera fauna of Isparta-Gölcük Nature Park and reported new records for the Mediterranean Region of Türkiye.

Studies conducted in Southeastern Anatolia have also revealed the rich Heteroptera fauna of the region. Bolu (2002) investigated insect and mite fauna in pistachio orchards, while Gözüaçık et al. (2011) contributed significantly to the knowledge of Pentatomidae fauna in Southeastern Anatolia. Matocq et al. (2014) evaluated Heteroptera species collected from the provinces of Diyarbakır, Mardin, and Elazığ. Furthermore, Özgen et al. (2020) emphasized the potential pest status of *Nysius cymoides* in Eastern and Southeastern Anatolia. Çerçi & Özgen (2021) also reported a new record for the Turkish fauna in their study on the Heteroptera fauna of Elazığ Province.

However, no comprehensive study has been conducted on Pentatomomorpha species associated with herbaceous plants in the Karacadağ area. Considering the natural plant diversity and habitat heterogeneity of the region, Karacadağ is thought to possess considerable potential in terms of Heteroptera fauna. Therefore, determining the species occurring in this area is important both for contributing to the entomofauna of Türkiye and for providing a basis for future studies on pest management, biodiversity, and ecology.

The present study aimed to determine the Pentatomomorpha (Heteroptera) species found on naturally growing herbaceous plants in the Karacadağ area of Diyarbakır and Şanlıurfa provinces. As a result of the study, the species diversity of the region was revealed, and some species were recorded for the first time from Diyarbakır and Şanlıurfa provinces.

## MATERIALS AND METHODS

The study area of the project consisted of locations situated on the slopes of Karacadağ within the provinces of Diyarbakır and Şanlıurfa (Figure 1).



**Figure 1.** Some areas of Karacadağ where the study was conducted.

### Materials

The main materials of the study consisted of naturally growing herbaceous plants on the slopes of Karacadağ in Diyarbakır and Şanlıurfa provinces, beneficial and harmful insects found in these areas, and the materials used during the collection and preservation of insect species, including killing jars, mouth aspirators, ethyl acetate, 70% alcohol, Petri dishes, ice containers, Eppendorf tubes, soft-tipped brushes, transparent polyethylene bags, paper bags, GPS devices, plastic jars, culture containers, and other laboratory equipment.

### Field Studies

#### Visual Inspection Method

Visual inspections were carried out on 25 randomly selected herbaceous plants in each survey area. Small insects found on the plants were collected using an aspirator, whereas larger insects were collected using soft forceps. The collected insects were transferred into killing jars containing ethyl acetate. The killed insects were then placed into Petri dishes containing drying paper and transported to the laboratory. Pre-adult specimens collected through visual inspection were brought to the laboratory together with the plant parts on which they were found for further examination.

#### Sweep Net Sampling

In the study area, sweep net sampling was performed randomly within an area of at least 40 m<sup>2</sup>. The collected insect specimens were killed in killing jars and then transferred into Petri dishes for laboratory examination.

## Laboratory Studies

Adult insects collected from the field and brought to the laboratory were first grouped according to their general morphological similarities. The specimens were then numbered, and information including collection locality, collection date, preliminary identification, and subsequent procedures was recorded. Adult specimens were preserved in Petri dishes within closed collection boxes. In addition, all adult specimens were properly pinned, while smaller species were mounted on triangular or rectangular cardboard points attached to insect pins. The specimens were prepared for identification, placed into collection boxes, and sent to specialists for taxonomic identification after the necessary documentation had been completed.

Pre-adult specimens collected by visual inspection and specimens brought together with their host plant parts were cultured separately in plastic containers of different sizes covered with tightly woven cloth in a climate chamber adjusted to  $26 \pm 1$  °C temperature,  $65 \pm 5\%$  relative humidity, 3500 lux light intensity, and a 16:8 h light/dark photoperiod. Adult specimens obtained from these cultures were also prepared for identification according to standard techniques and sent to specialists.

## RESULTS

### Pentatomomorpha

#### Superfamily Coreoidea Reuter, 1910

##### Family Coreidae Leach , 1815

##### *Coriomeris affinis* (Herrich-Schäffer, 1839)

**Material examined:** 2 specimens, 30.05.2021, 37°48'11"N 39°36'50"E, 1120 m (Siverek/Şanlıurfa).

**Distribution in Türkiye:** Çankırı, Hatay, Kastamonu, Muş, Sinop, Isparta, and throughout Türkiye (Önder et al., 2006; Dursun, 2011; Fent & Japoshvili, 2012; Fent & Dursun, 2019).

##### Family Rhopalidae Amyot and Serville, 1843

##### *Maccevetus caucasicus* (Kolenati, 1845)

**Material examined:** 1 specimen, 16.05.2021, 37°46'03"N 39°40'27"E, 1123 m (Siverek/Şanlıurfa); 1 specimen, 22.05.2021, 37°51'32"N 40°03'01"E, 780 m (Bağlar/Diyarbakır); 2 specimens, 30.05.2021, 37°49'59"N 39°39'32"E, 1070 m (Ergani/Diyarbakır).

**Distribution in Türkiye:** Edirne, Giresun, Nevşehir, Sivas, Tokat (Kıyak et al., 2004; Dursun, 2009; Dirik & Kıvan, 2016).

##### *Stictopleurus abutilon* (Rossi, 1790)

**Material examined:** 2 specimens, 30.05.2021, 37°48'11"N 39°36'50"E, 1120 m (Siverek/Şanlıurfa); 5 specimens, 22.05.2021, 37°49'54"N 40°00'48"E, 848 m (Bağlar/Diyarbakır); 2 specimens, 22.05.2021, 37°51'32"N 40°03'01"E, 780 m (Bağlar/Diyarbakır).

**Distribution in Türkiye:** Amasya, Bolu, Çankırı, Çorum, Diyarbakır, Düzce, Elazığ, Erzincan, Erzurum, Hatay, Iğdır, Karabük, Kastamonu, Mardin, Nevşehir, Sivas, Tokat (Dursun, 2009; Fent & Dursun, 2019; Zengin & Dursun, 2019; Yazıcı et al., 2022).

**Superfamily Lygaeoidea Schilling, 1829****Family Heterogastridae Stål, 1872*****Heterogaster urticae* (Fabricius, 1775)**

**Material examined:** 1 specimen, 16.05.2021, 37°47'47"N 39°37'15"E, 1113 m (Siverek/Şanlıurfa).

**Distribution in Türkiye:** Adana, Aksaray, Amasya, Ankara, Antalya, Artvin, Aydın, Balıkesir, Bartın, Bayburt, Bilecik, Bolu Bursa, Çankırı, Erzurum, Gaziantep, Hatay, İzmir, Kahramanmaraş, Karaman, Kars, Kayseri, Kırıkkale, Kütahya, Manisa, Mersin, Muğla, Nevşehir, Osmaniye, Samsun, Trabzon, Zonguldak (Fent & Dursun, 2024); Widespread throughout Türkiye (Önder et al., 2006).

**Note:** First faunistic record for Şanlıurfa Province.

**Family Lygaeidae Schilling, 1829*****Nysius cymoides* (Spinola, 1837)**

**Material examined:** 1 specimen 16.05.2021, 37°47'47 39°37'15, 1113 (Siverek/Şanlıurfa); 7 specimens 22.05.2021, 37°37'29 39°58'45, 1128 (Çınar/Diyarbakır).

**Distribution in Türkiye:** Southeastern Anatolia Region (Bolu, 2002), Widespread throughout Türkiye (Fent & Dursun, 2024).

***Nysius graminicola* (Kolenati, 1845)**

**Material examined:** 2 specimens, 30.05.2021, 37°45'49"N 39°43'02"E, 1194 m (Siverek/Şanlıurfa).

**Material examined:** 3 specimens, 30.05.2021, 37°46'35"N 39°37'25"E, 1103 m (Siverek/Şanlıurfa); 2 specimens, 22.05.2021, 37°51'32"N 40°03'01"E, 780 m (Bağlar/Diyarbakır); 11 specimens, 22.05.2021, 37°37'29"N 39°58'45"E, 1128 m (Çınar/Diyarbakır).

**Distribution in Türkiye:** Widespread throughout Türkiye (Fent & Dursun, 2024). *Nysius helveticus* (Herrich-Schäffer, 1850); Adana, Amasya, Ankara, Antalya, Artvin, Balıkesir, Elazığ, Erzurum, İzmir, Kars, Kastamonu, Muğla, Kayseri, Niğde (Fent & Dursun, 2024).

**Family Oxycarenidae Stål, 1862*****Brachyplax tenuis* (Mulsant & Rey, 1852)**

**Material examined:** 10 specimens, 22.05.2021, 37°37'29"N 39°58'45"E, 1128 m (Çınar/Diyarbakır).

**Distribution in Türkiye:** Amasya, Ankara, Edirne, Elazığ, Gaziantep, Hatay, İstanbul, İzmir, Kahramanmaraş, Karaman, Kastamonu, Kayseri, Kırklareli, Mersin, Niğde (Fent & Dursun, 2024).

***Oxycarenus pallens* (Herrich-Schaeffer, 1850)**

**Material examined:** 10 specimens, 16.05.2021, 37°46'03"N 39°40'27"E, 1123 m (Siverek/Şanlıurfa).

**Distribution in Türkiye:** Widespread throughout Türkiye (Fent & Dursun, 2024).

**Family Rhyparochromidae Amyot & Serville, 1843*****Emblethis* sp.**

**Material examined:** 3 specimens, 22.05.2021, 37°37'29"N 39°58'45"E, 1128 m (Çınar/Diyarbakır).

**Superfamily Pentatomoidea (Leach, 1815)****Family Pentatomidae Leach, 1815*****Acrosternum heegeri* (Fieber, 1861)**

**Material examined:** 1 specimen, 16.05.2021, 37°46'03"N 39°40'27"E, 1123 m (Siverek/Şanlıurfa).

**Distribution in Türkiye:** Widespread throughout Türkiye (Fent & Dursun, 2022).

***Ancyrosoma leucogrammes* (Gmelin, 1790)**

**Material examined:** 1 specimen, 16.05.2021, 37°47'47"N 39°37'15"E, 1113 m (Siverek/Şanlıurfa); 2 specimens, 22.05.2021, 37°51'32"N 40°03'01"E, 780 m (Bağlar/Diyarbakır).

**Distribution in Türkiye:** Widespread throughout Türkiye (Fent & Dursun, 2022).

***Aelia acuminata* (Linnaeus, 1758)**

**Material examined:** 15 specimens collected from Siverek, Bağlar, and Çınar districts between May and June 2021 at elevations ranging from 780 to 1634 m.

**Distribution in Türkiye:** Widespread throughout Türkiye (Fent & Dursun, 2022).

***Aelia albovittata* (Fieber, 1868)**

**Material examined:** 3 specimens, 22.05.2021, 37°34'09"N 39°50'22"E, 1424 m (Viranşehir/Şanlıurfa).

**Distribution in Türkiye:** Widespread throughout Türkiye (Fent & Dursun, 2022).

***Carpocoris coreanus* (Distant, 1899)**

**Material examined:** 2 specimens, 22.05.2021, 37°37'29"N 39°58'45"E, 1128 m (Çınar/Diyarbakır).

**Distribution in Türkiye:** Adıyaman, Ardahan, Diyarbakır, Elazığ, Erzurum, Gaziantep, Hatay, Iğdır, Kahramanmaraş, Kilis, Mardin, Siirt, Şanlıurfa, Şırnak (Fent & Dursun, 2022).

***Carpocoris pudicus* (Poda, 1761)**

**Material examined:** 1 specimen, 16.05.2021, 37°46'03"N 39°40'27"E, 1123 m (Siverek/Şanlıurfa); 1 specimen, 20.06.2021, 37°46'08"N 39°49'12"E, 1634 m (Bağlar/Diyarbakır); 2 specimens, 22.05.2021, 37°34'09"N, 39°50'22"E, 1424m (Viranşehir/Şanlıurfa).

**Distribution in Türkiye:** Widespread throughout Türkiye (Fent & Dursun, 2022).

***Dolycoris baccarum* (Linnaeus, 1758)**

**Material examined:** Numerous specimens collected from Siverek, Bağlar, and Çınar districts between May and June 2021.

**Distribution in Türkiye:** Widespread throughout Türkiye (Fent & Dursun, 2022).

***Piezodorus lituratus* (Fabricius, 1794)**

**Material examined:** 1 specimen, 22.05.2021, 37°51'32"N 40°03'01"E, 780 m (Bağlar/Diyarbakır).

**Distribution in Türkiye:** Widespread throughout Türkiye (Fent & Dursun, 2022).

***Peribalus strictus* (Fabricius, 1803)**

**Material examined:** 1 specimen, 30.05.2021, 37°50'40"N 39°42'03"E, 1051 m (Ergani/Diyarbakır).

**Distribution in Türkiye:** Widespread throughout Türkiye (Fent & Dursun, 2022).

***Eurydema ornata* (Linnaeus, 1758)**

**Material examined:** 14 specimens collected from Siverek and Bağlar districts during May 2021.

**Distribution in Türkiye:** Widespread throughout Türkiye (Fent & Dursun, 2022).

**Family Scutelleridae Leach, 1815*****Eurygaster integriceps* (Puton, 1881)**

**Material examined:** Numerous specimens collected from Siverek, Viranşehir, Bağlar, and Çınar districts between May and June 2021.

**Distribution in Türkiye:** Widespread throughout Türkiye (Önder et al., 2006).

***Eurygaster testudinaria* (Geoffroy, 1785)**

**Material examined:** 1 specimen, 30.05.2021, 37°50'40"N 39°42'03"E, 1051 m (Ergani/Diyarbakır); 1 specimen, 30.05.2021, 37°45'49"N 39°43'02"E, 1194 m (Siverek/Şanlıurfa).

**Distribution in Türkiye:** Amasya, Ankara, Ardahan, Artvin, Bartın, Çankırı, Edirne, Erzurum, İstanbul, Kahramanmaraş, Kastamonu, Kırklareli, Samsun, Tekirdağ, Tokat, Zonguldak (Fent & Aktaş, 2009; Yazıcı et al., 2022).

**Note:** First record for Diyarbakır and Şanlıurfa provinces.

***Odontotarsus purpureolineatus* (Rossi, 1790)**

**Material examined:** 3 specimens, 30.05.2021, 37°50'40"N 39°42'03"E, 1051 m (Ergani/Diyarbakır).

**Distribution in Türkiye:** Ardahan, Edirne, Erzurum, İstanbul, Kırklareli, Tekirdağ (Fent & Aktaş, 2009; Yıldırım et al., 2014).

**Note:** First record for Diyarbakır and Şanlıurfa provinces.

***Odontotarsus robustus* (Jakovlev, 1884)**

**Material examined:** 13 specimens collected from Bağlar and Çınar districts between May and June 2021.

**Distribution in Türkiye:** Adana, Afyon, Ankara, Antalya, Aydın, Balıkesir, Bilecik, Bursa, Çanakkale, Denizli, Diyarbakır, Edirne, Gaziantep, Isparta, Hatay, İçel, İstanbul, İzmir, Kahramanmaraş, Kars, Kırklareli, Konya, Muğla, Sakarya, and Uşak (Önder et al., 2006; Fent, 2011).

**DISCUSSION**

The present study revealed that the Karacadağ region hosts a rich Pentatomomorpha fauna associated with herbaceous vegetation. A total 23 species belonging to the families Coreidae, Rhopalidae, Heterogastridae, Lygaeidae, Oxycarenidae, Rhyparochromidae, Pentatomidae, and Scutelleridae were determined from different localities in Diyarbakır and Şanlıurfa provinces. The diversity of species recorded in the study demonstrates that the natural herbaceous flora of Karacadağ provides suitable ecological conditions for many Heteroptera species.

Among the identified species, *Dolycoris baccarum*, *Aelia acuminata*, and *Eurygaster integriceps* were the most abundant and widespread species in the surveyed areas. Especially *Eurygaster integriceps* was collected from several localities with high specimen numbers. This species is known as one of the most important pests of cereal crops in Türkiye and neighboring countries. Its high population density in the natural vegetation of Karacadağ suggests that the herbaceous flora of the region may serve as an important reservoir area for this species. Similar findings regarding the widespread occurrence of *E. integriceps* in Southeastern Anatolia were also reported by Gözüaçık et al. (2011).

Likewise, *Dolycoris baccarum* was represented by numerous specimens collected from several districts. The wide distribution and abundance of this species may be related to its polyphagous feeding behavior and strong ecological adaptability. Previous studies conducted in different regions of Türkiye also reported *D. baccarum* as a common species associated with herbaceous vegetation and agricultural habitats (Önder et al., 2006; Dursun & Kartal, 2008b; Fent & Dursun, 2022).

Another abundant species in the study was *Aelia acuminata*, which was recorded from different elevations and localities. The occurrence of this species in both low and high-altitude habitats indicates its ecological tolerance and adaptation capability. Since species belonging to the genus *Aelia* are generally associated with grasses and cereal plants, the extensive herbaceous vegetation in Karacadağ may contribute to the establishment of stable populations.

Within the Lygaeidae family, *Nysius helveticus* was among the relatively common species. Species belonging to the genus *Nysius* are known to feed on a wide range of host plants and may occasionally reach pest status under favorable environmental conditions (Yazıcı, 2022).

The study also provided important faunistic records for the region. *Heterogaster urticae* was recorded for the first time from Şanlıurfa Province, while *Eurygaster testudinaria* and *Odontotarsus purpureolineatus* were determined as first records for both Diyarbakır and Şanlıurfa provinces. These findings indicate that the Heteroptera fauna of Southeastern Anatolia has not yet been fully explored and that further faunistic surveys may reveal additional species records. Similar regional contributions to the Turkish Heteroptera fauna were previously emphasized by Matocq et al. (2014) and

Çerçi & Özgen (2021).

The dominance of Pentatomidae and Scutelleridae species in terms of specimen numbers may be associated with the dominance of herbaceous host plants and grass vegetation in the Karacadağ ecosystem. In addition, the volcanic structure, microclimatic diversity, and relatively undisturbed natural habitats of the region may contribute to the maintenance of species richness and population density.

Overall, the results demonstrate that Karacadağ represents an important habitat for Pentatomomorpha species in Southeastern Türkiye. The data obtained from this study contribute to the knowledge of the Turkish Heteroptera fauna and provide valuable baseline information for future biodiversity, ecological, and agricultural pest management studies.

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